Space Weather Forecast

Issued on Monday, 17 July 2023 at 13:29 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate R1/R2 Blackouts likely throughout G1/G2 Minor/Moderate Storms likely 17 July, and possible 18 July.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Moderate, with two Moderate flares observed, the largest from the large sunspot in the southwest, which is a large and mature region, but has decreased slightly in areal extent as it approaches the southwest limb. The other large region on the disc was the source of the other Moderate flare. This is a large open region in the northeast quadrant, with a simple and symmetric leader spot, but a more complex trailing spot. A further moderate moderately sized region in the northeast has also seen ongoing growth in its intermediate spots. There are currently nine sunspot regions on the visible disc.

Several CMEs (Coronal Mass Ejections) were observed leaving the Sun over the past 24 hours, however none of them are currently considered Earth-directed. The largest and fastest CMEs originated from a region located well beyond the western horizon. Further CMEs from the large region in the southwest have been analysed as not being Earth-directed. A fast CME from the western side of the disc, will be analysed once further imagery becomes available.

Solar Wind / Geomagnetic Activity: The solar wind showed the arrival of a CME from a yet to be determined source. The solar wind rose sharply from background to around elevated levels late on 16 July. The total magnetic field was initially weak but jumped sharply with the solar wind increase to moderate levels, but then steadily weakened. The north-south component has passed through two periods of moderately negative strength, first late on 16 July and again early on 17 July. Geomagnetic activity was Quiet at first, but rose to be Unsettled to Active due to effects of the CME arrival on the Earths magnetic field. A G1/Minor Storm interval was observed early on 17 July.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) rose above the S1 Minor Solar radiation Storm threshold between 16/0630-0910 UTC, reaching a peak of 18pfu at 16/0735 UTC, before slowly coming back down during the following hours.

Four-Day Space Weather Forecast Summary
Solar Activity: Moderate activity is likely, with a slight chance of Strong flares.

Solar Wind / Geomagnetic Activity: Current CME influence is expected to gradually ease early on 17 July but may be enhanced by a possible second CME which is due to arrive later on 17 July. CME effects could then continue with a declining magnitude into 18 July. A fast solar wind could then connect on 18 and 19 July, but this is low confidence due to the weak appearance of the feature. Solar wind conditions are then forecast to decline towards background from later on 19 and into 20 July.

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Unsettled to Active geomagnetic activity is likely at first, with a likelihood of G1/Minor storms, perhaps easing for a time later on 17 July before the arrival of the possible second CME later in the day. G1/G2 Minor/Moderate storms are likely due to this second feature. Ongoing CME effects are expected into 18 July, before gradually easing back to mainly Quiet with Unsettled spells by 19 Jul. However any further enhancement from the fats solar wind is likely to bring a spell of Active conditions, most likely on 19 July.

Energetic Particles / Solar Radiation: No solar radiation storms are currently expected, but there is a slight chance of reaching the S1/Minor Storm threshold through the period, should any large X-ray flares occur. An increase in observed count rates may also occur just ahead of the CME arrival expected on 17 July.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	70	40	5	5
Strong	G3	No	20	10	1	1
Severe	G4	No	2	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	80	70	60	60
Very Active	R3 to R5 X	No	15	15	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	Yes	25	15	10	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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